

Abstract Submitted  
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**A Bridge Too Far: Suppressing Frost Using an Out-of-Plane Dry Zone**<sup>1</sup> COREY SPOHN, FARZAD AHMADI, SAURABH NATH, JONATHAN BOREYKO, Virginia Tech — It has recently been shown that ice can suppress the formation of any nearby condensation or frost on a substrate. However, these in-plane dry zones require the hygroscopic ice features to be placed on the same surface they are helping to keep dry, which makes it impossible to achieve complete anti-frosting. Here, we create an out-of-plane dry zone by holding two aluminum surfaces parallel to each other, where a uniform sheet of frost was grown on one surface to keep the other surface completely dry. The critical separation required to keep the test surface dry was found to be a function of the ambient supersaturation. We also show that inter-droplet ice bridging, now known to be a primary mechanism for in-plane frost growth, can be similarly extended to an out-of-plane configuration. We freeze a droplet on a hydrophobic surface and suspend a water droplet above it, such that an ice bridge grows toward the water droplet. More generally, these findings show that the recently discovered phenomena of dry zones and ice bridging can be extended to out-of-plane scenarios, which could lead to a better understanding of the behavior of mixed-phase systems.

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